UTILITY PATENT APPLICATION TRANSMITTAL

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ADDRESS TO:

Assistant Commissioner for Patents
Box Patent Application
Washington, D.C. 20231

Attorney Docket No. 400926

First Named Inventor Tadao YAMAGUCHI

APPLICATION ELEMENTS	ACCOMPANYING APPLICATION PARTS
1. ☒ Transmittal Form ☒ with Fee	8. ☒ Assignment Papers (cover sheet and document(s))
2. ☒ Specification (including claims and abstract) [Total Pages 12]	9. ☐ Power of Attorney
3. ☒ Drawings [Total Sheets 4]	10. ☐ English Translation Document (if applicable)
4. ☒ Combined Declaration and Power of Attorney [Total Pages 4]	11. ☐ Information Disclosure Statement (IDS)
a. ☒ Newly executed	☐ Form PTO-1449
b. ☐ Copy from prior application **[Note Box 5 below]**	☐ Copies of References
i. ☐ Deletion of Inventor(s) Signed statement attached deleting inventor(s) named in the prior application	12. ☒ Preliminary Amendment
5. ☐ Incorporation by Reference: The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein	13. ☒ Return Receipt Postcard (Should be specifically itemized)
6. ☐ Microfiche Computer Program	14. ☐ Small Entity Statement(s)
7. ☐ Nucleotide and/or Amino Acid Sequence Submission	☐ Enclosed
a. ☐ Computer Readable Copy	☐ Statement filed in prior application; status still proper and desired
b. ☐ Paper Copy	15. ☐ Certified Copy of Priority Document(s)
c. ☐ Statement verifying above copies	16. ☒ PrintEFS printout
	17. ☐ Other:

18. **If a CONTINUING APPLICATION**, check appropriate box and supply the requisite information in (a) and (b) below:

(a) ☐ Continuation ☐ Divisional ☐ Continuation-in-part of prior application Serial No. .
Prior application information: Examiner ; Art Unit:

(b) Preliminary Amendment: Relate Back - 35 USC §120. The Commissioner is requested to amend the specification by inserting the following sentence before the first line:
"This is a ☐ continuation ☐ divisional of copending application(s)
☐ Application No. , filed on .
☐ International Application , filed on , and which designates the U.S."

APPLICATION FEES

BASIC FEE				$710.00
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	
Total Claims	10 -20=	0	x $18.00	$0.00
Independent Claims	4 - 3=	1	x $80.00	$80.00
☐ Multiple Dependent Claims(s) if applicable			+$270.00	$
			Total of above calculations =	$790.00
			Reduction by 50% for filing by small entity =	$( )
☒ Assignment fee if applicable			+ $40.00	$40.00
			TOTAL =	$830.00

UTILITY PATENT APPLICATION TRANSMITTAL | Attorney Docket No. 400926

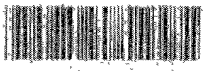
19. ☐ Please charge my Deposit Account No. 12-1216 in the amount of $.

20. ☒ A check in the amount of $830.00 is enclosed.

21. The Commissioner is hereby authorized to credit overpayments or charge any additional fees of following types to Deposit Account No. 12-1216:
    a. ☒ Fees required under 37 CFR §1.16.
    b. ☐ Fees required under 37 CFR §1.17.

22. ☐ The Commissioner is hereby generally authorized under 37 CFR §1.136(a)(3) to treat any future reply in this or any related application filed pursuant to 37 CFR §1.53 requiring an extension of time as incorporating a request therefor, and the Commissioner is hereby specifically authorized to charge Deposit Account No. 12-1216 for any fee that may be due in connection with such a request for an extension of time.

23. CORRESPONDENCE ADDRESS



PATENT TRADEMARK OFFICE

Name	Jeffrey A. Wyand; Reg. No. 29,458
Signature	
Date	November 13, 2000

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Citizenship Country:: Japan

CORRESPONDENCE INFORMATION

Correspondence Customer Number:: 23548

APPLICATION INFORMATION

Title Line One:: MAGNETIC ASSEMBLY STRUCTURE USED FOR COM
Title Line Two:: PACT ELECTRIC APPARATUS, METHOD OF FABRI
Title Line Three:: CATING THE MAGNETIC ASSEMBLY STRUCTURE,
Title Line Four:: AND COMPACT ELECTRIC APPARATUS ADOPTING
Title Line Five:: THE MAGNETIC ASSEMBLY STRUCTURE
Total Drawing Sheets:: 4
Formal Drawings?:: Yes
Application Type:: Utility
Docket Number:: 400926
Secrecy Order in Parent Appl.?:: No

PRIOR FOREIGN APPLICATIONS

Foreign Application One:: 11-322024
Filing Date:: 11-12-1999
Country:: Japan
Priority Claimed:: Yes

Source:: PrintEFS Version 1.0.1

Patent
Attorney Docket No. 400926

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

TADAO YAMAGUCHI

Serial No.:	Unassigned	Art Unit:	Unassigned
Filed:	November 13, 2000	Examiner:	Unassigned
For:	MAGNETIC ASSEMBLY STRUCTURE USED FOR COMPACT ELECTRIC APPARATUS, METHOD OF FABRICATING THE MAGNETIC ASSEMBLY STRUCTURE, AND COMPACT ELECTRIC APPARATUS ADOPTING THE MAGNETIC ASSEMBLY STRUCTURE		

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D. C. 20231

Dear Sir:

Prior to examination, Applicant requests that the referenced patent application be amended as shown below.

IN THE DRAWINGS

The Examiner is requested to approve the changes to Figures 4B and 5 as indicated in the attached Request for Approval of Drawing Amendment.

IN THE SPECIFICATION

Page 1, line 10, change "to" to --in--

change "apparatuses" to --apparatus--;

line 15, change "apparatuses" to --apparatus--;

line 18, change "erected" to --located--;

delete "formed";

line 24, delete "portion";

line 25, delete "formed";

line 26, change "where" to --including--;

delete "is arranged";

line 27, change "where" to --with--;

delete "is installed--;

line 29, delete "formed";

lien 32, change "at" to --on--;

Page 2, lines 5-6, delete "it may be a problem that";

line 6, change "magnetism deteriorates" to --magnetic field may deteriorate--;

line 9, delete "formed such that they are";

line 12, delete "in";

line 13, change "is" to --may be--;

line 15, change "an" to --the--;

line 17, delete "predetermined";

Page 4, line 22, change "Y-Y" to --I-I--;

line 25, change "X-Z" to --II-II--;

Page 5, line 6, change "N-M" to --VI-VI--;

line 12, delete "formed";

line 13, delete "a";

line 15, change "formed" to --mounted--;

change "1f" to --f1--;

line 18, change "2f" to --f2--;

line 20, delete "in";

line 24, change "inserted over" to --placed over and surrounds--;

line 25, delete "portion"

line 26, change "portion 3b" to --3b of the feeder terminal 3--;

delete "portion" (second occurrence);

lines 26-27, delete "is vertically erected, and";

line 27, after "the" insert --feeder terminal--;

delete "portion";

after "such" insert --an--;

line 28, change "portion 5a which is formed of thin wires" to --5a feeder terminal which is a thin wire--;

line 32, delete "formed";

change "where a" to --with a centrally located--;

delete "arranged is";

Page 6, line 1, change "portion 4a integrally" to --4a--;

line 2, after "7" insert --,--;

line 3, change "thermal" to --a thermally--;

change "where" to --with--;

delete "type";

line 4, delete "are installed";

change "ultrasonic-welded" to --ultrasonically welded--;

line 8, change "is formed not to" to --does not--;

delete "and";

line 9, delete "type";

line 10, change "has a function to prevent" to --prevents--;

line 14, change "by" to --,--;

line 15, change "20" to --twenty--;

line 16, delete "by";

line 17, change "the arrangement of the end portions" to --the ends--;

line 18, change "and installation of" to --are arranged and--;

change "is performed" to --is installed--;

line 19, change 'is formed to have" to --has--;

line 23, delete "formed";

change 'where" to --on which--;

lines 23-24, change "is configured to have" to --has--;

line 27, change "is formed to have" to --has--;

line 29, delete "formed";

line 30, after "example" insert --, of---;

line 32, change "formed of" to --of a--;

Page 7, line 2, change "elastic" to --resilient--;

line 6, change "installed toward" to --mounted on--;

line 9, change "1f" to --f1--;

line 10, change "2f" to --f2--;

line 13, change "formed" to --located--;

line 14, change "installed at a portion" to --located--;

line 15, change "to" (second occurrence) to --and--;

line 16, delete "corresponding type";

line 18, change "at" to --on--;

delete "formed";

line 19, delete "a" (first occurrence);

delete "effect";

lines 20-21, delete "at a portion";

Page 8, lines 1-2, delete "according to means for achieving the object indicated in claims 1 and 2,";

line 2, delete "to";

line 5, change "According to means for achieving the object indicated in claims 3 and 4, the" to --The--;

lines 7-8, change "According to means for achieving the object indicated in claims 5 and 6, chucking" to --Chucking--;

lines 9-10, change "According to a fabricating method for achieving the object indicated in claim 7, the" to --The--;

line 10, delete "made to be somewhat";

line 11, change "electric" to --electrical--;

line 13, change "According to means for achieving the object indicated in claims 8 and 9, since" to --Since--;

line 14, delete "made to be somewhat";

line 16, delete "type";

line 18, delete "according to the invention defined in claim 10,";

delete "type";

line 19, delete "formed of";

delete "thereof is";

line 20, delete "the" (first occurrence);

after "view" insert --is rectangular--;

change "the" (third occurrence) to --a--;

line 21, delete "thereof".

IN THE CLAIMS

1. (Amended) A magnetic assembly structure comprising:

first and second lead frames, the second lead frame being thinner than the first lead frame;

a magnetic yoke [formed of a magnetic material to be] connected [on a] to the first lead frame and separated from the first lead frame at a connection portion of the yoke;

at least one solderable, non-corroding feeder terminal [having an anticorrosion feature and exhibiting solderability, formed to be] connected [on a] to the second lead frame [thinner than the first lead frame] and [to be] separated from the second lead frame at a connection portion of the second lead frame, at least one feeder terminal being [arranged to be] electrically insulated from the yoke;

a resin base [formed of anti-solderability resin for] insulating [at least a part between] the yoke [and] from the feeder terminal, in which the connection

portion of the yoke [to be separated is incorporated not to] does not protrude [outside the planar] beyond a surface of the base; and

[a ring type] an annular magnet arranged [above] about the yoke.

2. (Amended) The structure as claimed in claim 1, wherein the feeder terminal is [formed of] a [thin] German silver plate and the yoke is [formed of anti-corrosion] processed iron.

3. (Amended) The structure as claimed in claim 1, wherein the magnet is [slightly] separated from the yoke [so that] for reflow soldering [is possible].

4. (Amended) The structure as claimed in claim 2, wherein the magnet is [slightly] separated from the yoke [so that] for reflow soldering [is possible].

5. (Amended) The structure as claimed in claim 1, wherein the [overall shape of the plan view is] structure has a rectangular shape and has a mounting portion including a feeder terminal [is arranged] at each corner of the rectangular shape.

6. (Amended) The structure as claimed in claim 5, wherein the mounting portion including the feeder terminal does not protrude [outside by] beyond the rectangular [corners] shape.

7. (Amended) A method of fabricating a magnetic assembly structure comprising [a steps of]:

forming a first lead frame [by installing a plurality of yokes] connected by first connection portions at a [predetermined] pitch and including a plurality of yokes at the pitch;

forming a second lead frame [by installing a] on the plurality of yokes and connected by second connection portions at [a predetermined] the pitch;

insulating at least a part of the first and second lead frames and forming an integrated base [out of anti-solderability resin] by injection[-]molding a resin; and

separating each of installation portions [to form the] with a yoke and a feeder terminal, the installation portions each having [a predetermined] the same shape.

8. (Amended) An [electric apparatus] electroacoustic transducer including a magnetic assembly structure [which comprises] comprising:

a magnetic yoke [formed of a magnetic material to be] connected to a first lead frame and separated from the first lead frame at a connection portion of the yoke;

at least one solderable, non-corroding feeder terminal [having an anticorrosion feature and exhibiting solderability, formed to be] connected [on] to a second lead frame [thinner than the first lead frame] and [to be] separated from the second lead frame at a connection portion of the second lead frame, at least one feeder terminal being [arranged to be] electrically insulated from the yoke;

a resin base [for] insulating [at least a part between] the yoke [and] from the terminal, [formed of anti-solderability resin into which] the connection portion of the yoke [to be separated is incorporated] not [to protrude outside] protruding beyond the base; and

[a ring type] an annular magnet arranged [above] about the yoke[, wherein the electric apparatus is an electroacoustic transducer].

9. (Amended) [An electric apparatus] A DC motor including a magnetic assembly structure [which comprises] comprising:

a magnetic yoke [formed of a magnetic material to be] connected to a first lead frame and separated from the first lead frame at a connection portion of the yoke;

at least one solderable, non-corroding feeder terminal [having an anticorrosion feature and exhibiting solderability, formed to be] connected [on] to a second lead frame [thinner than the first lead frame] and [to be] separated from the second lead frame at a connection portion of the second lead frame, at least one feeder terminal being [arranged to be] electrically insulated from the yoke;

a resin base [for] insulating [at least a part between] the yoke [and] from the terminal, [formed of anti-solderability resin into which] the connection portion of the yoke [to be separated is incorporated] not [to protrude outside] protruding beyond the base; and

[a ring type] an annular magnet arranged [above] about the yoke[, wherein the electric apparatus is a DC motor].

10. (Amended) The [electric apparatus] DC motor as claimed in claim 9, wherein the DC motor is a flat vibratory motor, [the outside of the DC motor on the planar surface of] the base [is formed of resin to be] has a non-circular planar surface, [and in which] the feeder terminal is [arranged in the] located at a corner of the DC motor, and the [outside of the] DC motor is exposed laterally.

IN THE ABSTRACT

Please replace the existing Abstract of the Disclosure with the appended Abstract of the Disclosure.

REMARKS

The foregoing changes are made to improve the form of the patent application. No new matter has been added and entry is respectfully requested.

A favorable Action on the merits is solicited.

Respectfully submitted,

LEYDIG, VOIT & MAYER

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In re Appln. of Tadao Yamaguchi
Serial No. Unassigned

ABSTRACT OF THE DISCLOSURE

A magnetic assembly structure includes a magnetic yoke connected to a first lead frame and separated at a connection portion of the yoke, at least one solderable feeder terminal connected to a second lead frame thinner than the first lead frame and separated from the yoke at a connection portion of the second lead frame, at least one feeder terminal electrically insulated from the yoke, a resin base insulating the yoke from the terminal, the connection portion of the yoke not protruding outside the base, and an annular magnet surrounding the yoke.

MAGNETIC ASSEMBLY STRUCTURE USED FOR COMPACT ELECTRIC APPARATUS, METHOD OF FABRICATING THE MAGNETIC ASSEMBLY STRUCTURE , AND COMPACT ELECTRIC APPARATUS ADOPTING THE MAGNETIC ASSEMBLY STRUCTURE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a magnetic assembly structure used for a compact electric apparatus, a method of fabricating the magnetic assembly structure, and a compact electric apparatus adopting the magnetic assembly structure, and more particularly, to improvements to electric apparatuses such as electroacoustic transducers and DC motors.

2. Description of the Related Art

it is well known that an electroacoustic transducer or a vibration motor which is a silent calling means can be used as an alarming source in a mobile communications apparatus. Both of these apparatuses use a magnetic assembly structure.

When the magnetic assembly structure is used for an electroacoustic transducer, a pole piece is erected at the center of a yoke formed of a magnetic material on which a low profile cylindrical magnet is placed. A resin base is formed integrally with a plurality of feeder terminals. A previously wound air-core coil is inserted in the pole piece and end portions thereof are connected to the terminals by soldering.

To configure an electroacoustic transducer by using the magnetic assembly structure, a boss portion is integrally erected from the base at the outside of the low profile cylindrical magnet, and a vibratory plate formed of thin stainless steel or Permalloy™ where a magnetic material is arranged is placed on the boss portion. A case where a sound hole is installed covers the vibratory plate.

Also, as another example of the magnetic assembly structure used for a flat DC vibration motor, a shaft holder is installed at the center of a bracket formed of a magnetic material and also used as the yoke on which a low cylindrical magnet is placed, and a shaft is fixed to the shaft holder. Then, an eccentric rotor is rotatably installed at the shaft, and is covered by a low profile case.

However, according to recent trends in making a small and light mobile communications apparatus such as mobile phones and in the automation of assembly processes, magnetic assemblies are becoming more compact and an easy reflow soldering type is needed.

However, when the above magnetic assembly structure is used, it may be a problem that the magnetism deteriorates due to high temperature during reflow soldering.

Also, according to recent trends in the automation of production processes and in low power consumption, the yoke and terminals are formed such that they are connected by a signal lead frame and integrally formed by using resin. Then, the connection portions therebetween are cut. Since the feeder terminal is formed of the same magnetic body (steel plate) as in the yoke, the sectional surface of the feeder terminal is corroded, making reflow soldering difficult. Also, since the feeder terminal is thick, solderability deteriorates. Accordingly, soldering for a longer time is needed so that an effect of thermal insulation is lowered.

Since the yoke serves as a magnetic path for the magnet, a yoke having a predetermined thickness at which the magnetic flux is not saturated is needed. Thus, it is not preferred to make the yoke by using a material having the same thickness as that of the feeder terminal.

SUMMARY OF THE INVENTION

To solve the above problems, it is an object of the present invention to provide a magnetic assembly structure having a superior reflow soldering feature considering thermal insulation of a magnet, in which the terminal is formed to be thin and easy to solder so that reflow soldering can be easily performed, and simultaneously, the yoke is formed to be appropriately thick to secure a magnetic path, a method of fabricating the magnetic assembly structure, and an electric apparatus using the magnetic assembly structure.

Accordingly, to achieve the above object, there is provided a magnetic assembly structure comprising a yoke formed of a magnetic material to be connected on a first lead frame and separated at a connection portion, at least one feeder terminal having an anticorrosion feature and exhibiting soderability, formed to be connected on a second lead frame thinner than the first lead frame and to be

separated at a connection portion, at least one feeder terminal being arranged to be insulated from the yoke, a base formed of anti-solderability resin for insulating at least a part between the yoke and the terminal, in which the connection portion of the yoke to be separated is incorporated not to protrude outside, and a ring type magnet arranged above the yoke.

It is preferred in the present invention that the feeder terminal is formed of a thin German silver plate and the yoke is formed of a anti-corrosion processed steel plate.

Also, it is preferred in the present invention that the magnet is slightly separated from the yoke so that reflow soldering is possible.

Also, it is preferred in the present invention that the overall shape of the plan view is rectangular and a mounting portion including a feeder terminal is arranged at each corner of the rectangular shape.

Also, it is preferred in the present invention that the mounting portion including the feeder terminal does not protrude outside by the rectangular corners.

To achieve the above object, there is provided a method of fabricating a magnetic assembly structure which is achieved by forming a first lead frame by installing a plurality of yokes connected by connection portions at a predetermined pitch, forming a second lead frame by installing a plurality of yokes connected by connection portions at a predetermined pitch, insulating at least a part of the first and second lead frames and forming an integrated base out of anti-solderability resin by injection-molding, and separating each of installation portions to form the yoke and feeder terminal having a predetermined shape.

To achieve the above object, there is provided an electric apparatus including a magnetic assembly structure which comprises a yoke formed of a magnetic material to be connected to a first lead frame and separated at a connection portion, at least one feeder terminal having an anticorrosion feature and exhibiting solderability, formed to be connected on a second lead frame thinner than the first lead frame and to be separated at a connection portion, at least one feeder terminal being arranged to be insulated from the yoke, a base for insulating at least a part between the yoke and the terminal, formed of anti-solderability resin into which the connection portion of the yoke to be separated is incorporated not to protrude

outside, and a ring type magnet arranged above the yoke, wherein the electric apparatus is an electroacoustic transducer.

To achieve the above object, there is provided an electric apparatus including a magnetic assembly structure which comprises a yoke formed of a magnetic material to be connected on a first lead frame and separated at a connection portion, at least one feeder terminal having an anticorrosion feature and exhibiting soderability, formed to be connected on a second lead frame thinner than the first lead frame and to be separated at a connection portion, at least one feeder terminal being arranged to be insulated from the yoke, a base for insulating at least a part between the yoke and the terminal, formed of anti-solderability resin into which the connection portion of the yoke to be separated is incorporated not to protrude outside, and a ring type magnet arranged above the yoke, wherein the electric apparatus is a DC motor.

It is preferred in the present invention that the DC motor is a flat vibratory motor, the outside of the DC motor is formed of resin to be non-circular, and in which the feeder terminal is arranged in the corner of the DC motor and the outside of the DC motor is exposed laterally.

BRIEF DESCRIPTION OF THE DRAWINGS

The above object and advantages of the present invention will become more apparent by describing in detail preferred embodiments thereof with reference to the attached drawings in which:

FIG. 1 is a sectional view, taken along line X-Y of FIG. 4B described below, schematically showing a magnetic assembly structure according to a preferred embodiment of the present invention;

FIG. 2 is a sectional view, taken along line X-Z of FIG. 4B described below, showing an electroacoustic transducer using the magnetic assembly structure of FIG. 1;

FIG. 3 is a view for explaining a method of fabricating the magnetic assembly structure of FIG. 1;

FIG. 4A is a plan view of first and second lead frames for explaining the method of fabricating the magnetic assembly strucutre;

FIG. 4B is a plan view of one magnetic assembly structure unit separated from the first and second lead frames of FIG. 4A and integrally formed by using liquid crystal resin;

FIG. 5 is a plan view showing a magnetic assembly structure according to another preferred embodiment of the present invention; and

FIG. 6 is a sectional view, taken along line N-M of FIG. 5, showing a flat vibratory motor using the magnetic assembly structure according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, a magnetic assembly structure used for an electroacoustic transducer according to a preferred embodiment of the present invention includes a yoke 2 formed of a magnetic material to which a low profile cylindrical magnet 1 is attached via an acrylic based a double-side adhesive member 1b. A pole piece 2a is erected at the center of the yoke 2. As shown in FIG. 3, a plurality of connected yokes 2 are formed on a first lead frame 1f which is formed of galvanized sheet iron having a thickness of 0.35 through 0.5 mm, at a pitch of one unit magnetic assembly structure. A plurality of connected feeder terminals 3 are formed on a second lead frame 2f which is formed of a thin plate exhibiting a superior anticorrosion feature and solderability, such as German silver having a thickness of about 0.15 mm, at the same pitch as in the yoke 2. The yoke 2 and the feeder terminal 3 of the first and second lead frames f1 and f2 are integrally formed with a plurality of feeder terminals 3 in a base 4 exhibiting anti-solderabilitiy, such as liquid crystal resin.

A previously wound air-core coil 5 is inserted over the pole piece 2a. An end portion 5a of the coil 5 passes under the magnet 1 and is wound around an end portion 3b. The end portion 5a extends inward from the feeder terminal 3 and is vertically erected, and is soldered to the end portion 3b. By such inside connection, a means for protecting the end portion 5a which is formed of thin wires is not needed.

In order to configure an electroacoustic transducer by using the magnetic assembly structure having the magnet, as shown in FIG. 2, a vibratory plate 6 formed of a thin stainless steel plate where a magnetic material 6a is arranged is

placed at the top of a boss portion 4a integrally protruding from the base 4 at the outer circumferential side of the low profile cylindrical magnet 1. A case 7 formed of thermal resistant resin where a sound hole 7a and a sponge type restriction member 7b are installed, covers the vibratory plate 6 and is ultrasonic-welded. Then, a connection portion of the yoke 2 and a connection portion of the feeder terminal 3 are respectively cut so that a single electroacoustic transducer is obtained.

Also, to achieve thermal insulation during reflow soldering, a cut portion 2b of the yoke 2 is formed not to protrude over the outer edge of the base 4 and so that the bottom surface thereof is not contacted. Also, the sponge type restriction member 7b has a function to prevent deformation of the vibratory plate 6 when impacted.

To fabricate the magnetic assembly structure, the first lead frame f1 and the second lead frame f2, as shown in FIG. 3, are continuously supplied to a mold for molding the base 4 by insulating at least one of the feeder terminals 3 from the yoke 2. Then, about 20 bases 4 having a desired shape are connected and integrally formed at the same time by using liquid crystal resin exhibiting anti-solderability. Thereafter, the air-core coil 5 is installed, and the arrangement of the end portions of the coil 5 and installation of the magnet 1 are performed. Then, the connection portions are cut so that each of the feeder terminals 3 is formed to have a predetermined shape.

Referring to FIG. 5, in a magnetic assembly structure used for a flat vibratory rotor according to another preferred embodiment of the present invention, a yoke formed of a magnetic material where a low profile cylindrical magnet 11 is placed, is configured to have a shape of a bracket 22 and a shaft holder 22a is erected at the center of the bracket 22. The bracket 22 is separated from the first lead frame f1 formed of a galvanized sheet iron having a thickness of 0.35 through 0.5 mm as in the above-described embodiment, and is formed to have a plan view which is rectangular, together with a plurality of feeder terminals 3 including a dummy terminal. The feeder terminals 3 are separated from a second lead frame f2 formed of a thin plate member, for example thin German silver, having an anticorrosion feature and exhibiting superior solderability. Thus, the first and second lead frames f1 and f2 are incorporated into a base 44 formed of liquid crystal resin exhibiting anti-solderability. Also, the feeder terminal arranged at each of the corners of the

rectangle functioning as a mounting portion may be laterally exposed to the outside so that chucking is easily performed. Noble metal-clad elastic brushes 8a and 8b having a thickness of 0.05 mm, for example, are disposed in the inner diametric portion of the low profile cylindrical magnet 11. Base portions of the brushes 8a and 8b are disposed together with the feeder terminal 3 under the magnet 11. The magnet 11 is installed toward the bracket 22 with an acrylic adhesive A having a thickness of 0.15 mm on the upper surface of the brushes 8a and 8b. Here, the brushes 8a and 8b are separated from a third lead frame (not shown) to have a predetermined shape at the same pitch as the first and second lead frames 1f and 2f, and are arranged together with the feeder terminal 3 at the base portion of the brushes 8a and 8b after the base 44 is molded.

Also, in this case, in order to insulate the brush 8b at one side, a clearance groove 22b is formed at a neutral position of the magnet 11. Also, to insulate the bracket 22, a concave portion 22c is installed at a portion where the connection portion is to be cut. Magnet arrangement guides 22d protrude to face one another.

To use the above magnetic assembly structure in a reflow corresponding type flat vibratory motor, as shown in FIG. 6, a shaft J is fixed to the shaft holder 22a, and an eccentric rotor 9 is rotatably installed at the shaft J. A case 77 formed of thermal resistant resin providing a thermal insulation effect, in which a return bus plate 77a formed of a magnetic material to make a magnetic path at least at a portion facing the magnet 11, covers the magnetic assembly structure. Also, at least one of the feeder terminals 3 is insulated from the yoke 22.

Also, although a flat coreless vibratory motor having an eccentric rotor is described as a vibration source in the above preferred embodiments, the magnetic assembly structure can be adopted to a typical rotation type motor such as a pickup transfer motor in an MD player.

It is noted that the present invention is not limited to the preferred embodiment described above, and it is apparent that variations and modifications by those skilled in the art can be effected within the spirit and scope of the present invention defined in the appended claims.

As described above, in the magnetic assembly structure according to the present invention, the features thereof are not deteriorated and reflow soldering is simplified.

That is, according to means for achieving the object indicated in claims 1 and 2, the features are maintained by making the yoke to have a predetermined thickness, and, since the feeder terminal can be made thin, reflow soldering can be easily performed.

According to means for achieving the object indicated in claims 3 and 4, the magnet can be insulated to a certain degree from heat during reflow soldering.

According to means for achieving the object indicated in claims 5 and 6, chucking can be easily performed during automatic transfer.

According to a fabricating method for achieving the object indicated in claim 7, the yoke is made to be somewhat thick to maintain the feature thereof, and, since the feeder terminal can be made thin, a compact electric part having a magnet enabling easy reflow soldering can be easily fabricated.

According to means for achieving the object indicated in claims 8 and 9, since the yoke is made to be somewhat thick to maintain the feature thereof, and the feeder terminal can be made thin, an electroacoustic transducer or a DC motor, particularly, a flat type vibratory motor, in which reflow soldering can be simplified, can be realized.

Also, according to the invention defined by claim 10, in a flat type vibratory motor, since the outer side thereof is formed of resin so that the shape thereof is in the plan view, the feeder terminal is arranged at the corner, and the outer surface thereof is laterally exposed, the motor can be easily chucked or mounted on an automatic transfer machine and reflow soldering can be easily performed.

What is claimed is:

1. A magnetic assembly structure comprising:

a yoke formed of a magnetic material to be connected on a first lead frame and separated at a connection portion;

at least one feeder terminal having an anticorrosion feature and exhibiting solderability, formed to be connected on a second lead frame thinner than the first lead frame and to be separated at a connection portion, at least one feeder terminal being arranged to be insulated from the yoke;

a base formed of anti-solderability resin for insulating at least a part between the yoke and the terminal, in which the connection portion of the yoke to be separated is incorporated not to protrude outside the planar surface of the base; and

a ring type magnet arranged above the yoke.

2. The structure as claimed in claim 1, wherein the feeder terminal is formed of a thin German silver plate and the yoke is formed of anti-corrosion processed iron.

3. The structure as claimed in claim 1, wherein the magnet is slightly separated from the yoke so that reflow soldering is possible.

4 The structure as claimed in claim 2, wherein the magnet is slightly separated from the yoke so that reflow soldering is possible.

5. The structure as claimed in claim 1, wherein the overall shape of the plan view is rectangular and a mounting portion including a feeder terminal is arranged at each corner of the rectangular shape.

6. The structure as claimed in claim 5, wherein the mounting portion including the feeder terminal does not protrude outside by the rectangular corners.

7. A method of fabricating a magnetic assembly structure comprising a steps of:

forming a first lead frame by installing a plurality of yokes connected by connection portions at a predetermined pitch;

forming a second lead frame by installing a plurality of yokes connected by connection portions at a predetermined pitch;

insulating at least a part of the first and second lead frames and forming an integrated base out of anti-solderability resin by injection-molding; and

separating each of installation portions to form the yoke and feeder terminal having a predetermined shape.

8. An electric apparatus including a magnetic assembly structure which comprises a yoke formed of a magnetic material to be connected to a first lead frame and separated at a connection portion, at least one feeder terminal having an anticorrosion feature and exhibiting solderability, formed to be connected on a second lead frame thinner than the first lead frame and to be separated at a connection portion, at least one feeder terminal being arranged to be insulated from the yoke, a base for insulating at least a part between the yoke and the terminal, formed of anti-solderability resin into which the connection portion of the yoke to be separated is incorporated not to protrude outside, and a ring type magnet arranged above the yoke, wherein the electric apparatus is an electroacoustic transducer.

9. An electric apparatus including a magnetic assembly structure which comprises a yoke formed of a magnetic material to be connected on a first lead frame and separated at a connection portion, at least one feeder terminal having an anticorrosion feature and exhibiting soderability, formed to be connected on a second lead frame thinner than the first lead frame and to be separated at a connection portion, at least one feeder terminal being arranged to be insulated from the yoke, a base for insulating at least a part between the yoke and the terminal, formed of anti-solderability resin into which the connection portion of the yoke to be separated is incorporated not to protrude outside, and a ring type magnet arranged above the yoke, wherein the electric apparatus is a DC motor.

10. The electric apparatus as claimed in claim 9, wherein the DC motor is a flat vibratory motor, the outside of the DC motor on the planar surface of the base

is formed of resin to be non-circular, and in which the feeder terminal is arranged in the corner of the DC motor and the outside of the DC motor is exposed laterally.

Abstract of the Disclosure

A magnetic assembly structure includes a yoke formed of a magnetic material to be connected on a first lead frame and separated at a connection portion, at least one feeder terminal having an anticorrosion feature and exhibiting soderability, formed to be connected on a second lead frame thinner than the first lead frame and to be separated at a connection portion, at least one feeder terminal being arranged to be insulated from the yoke, a base formed of anti-solderability resin for insulating at least a part between the yoke and the terminal, in which the connection portion of the yoke to be separated is incorporated not to protrude outside, and a ring type magnet arranged above the yoke.

FIG. 1

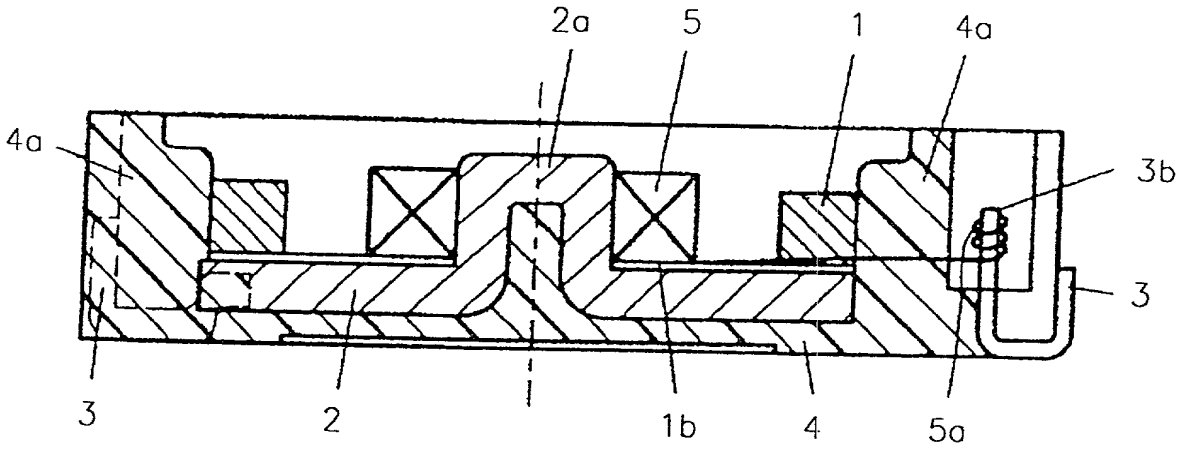

FIG. 2

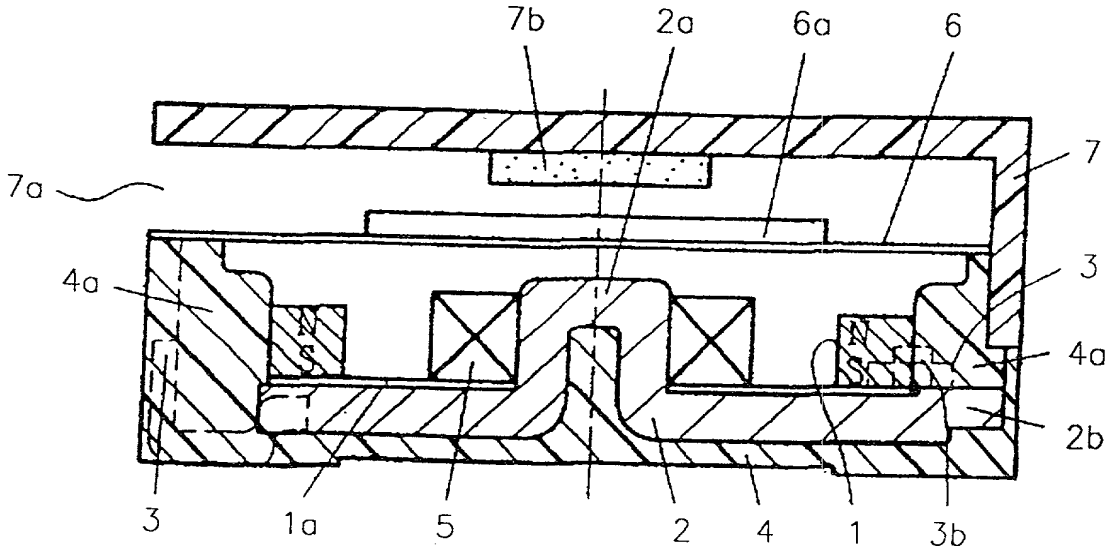

FIG. 3

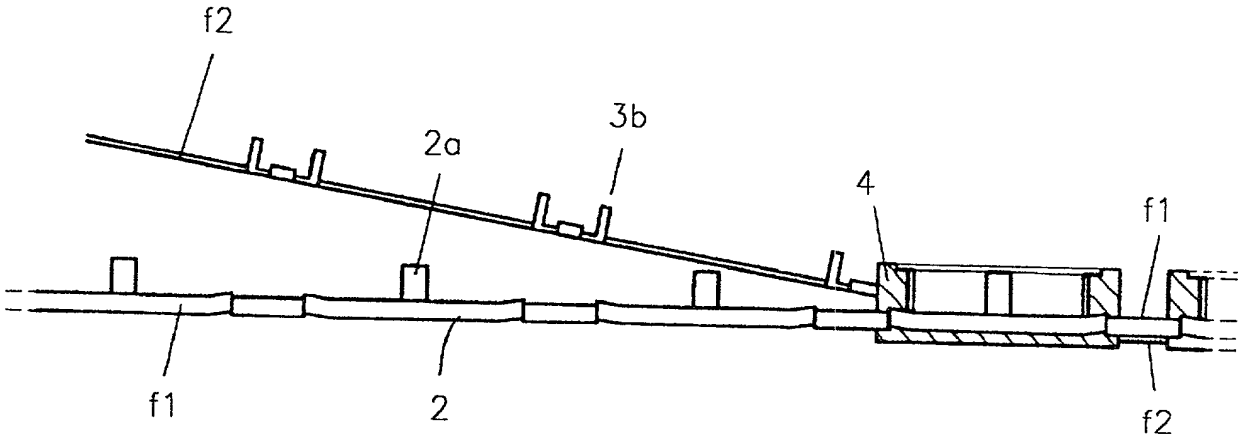

FIG. 4A

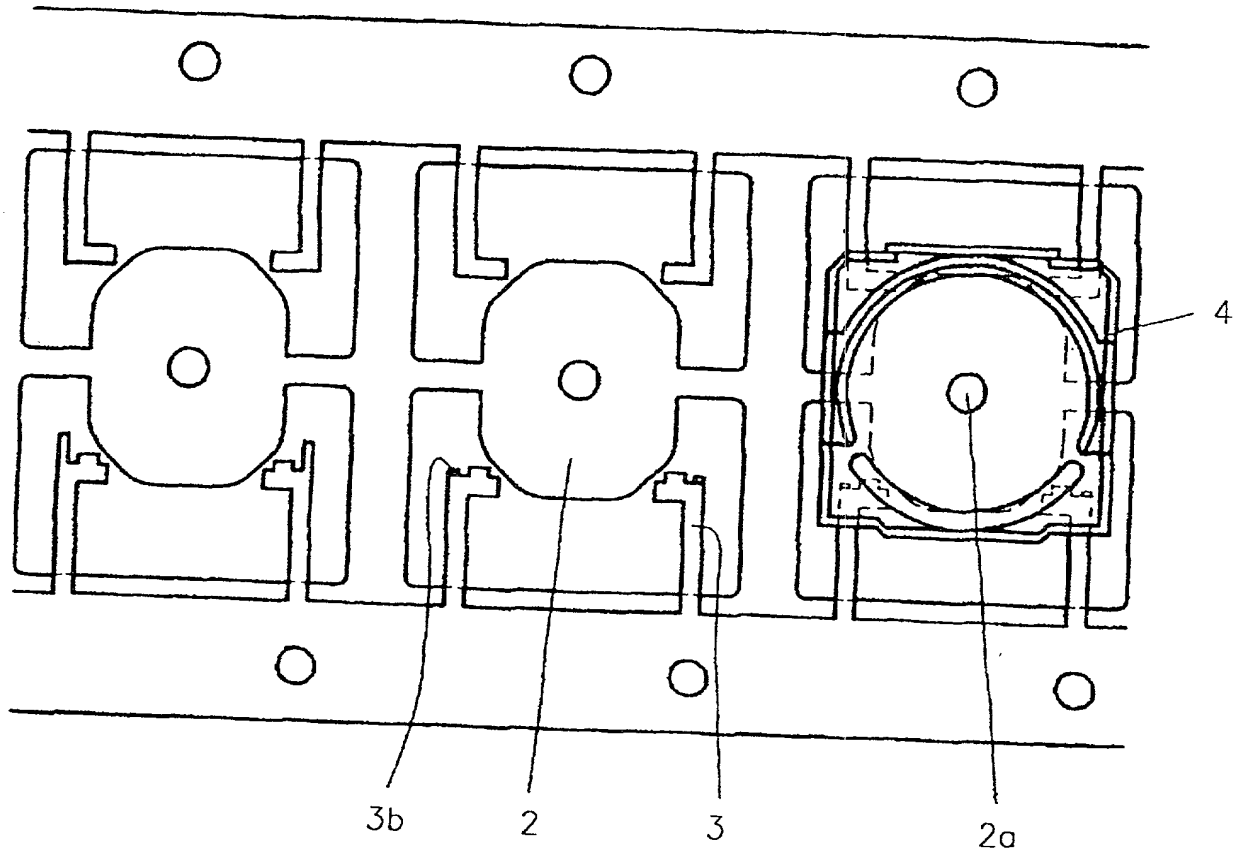

FIG. 4B

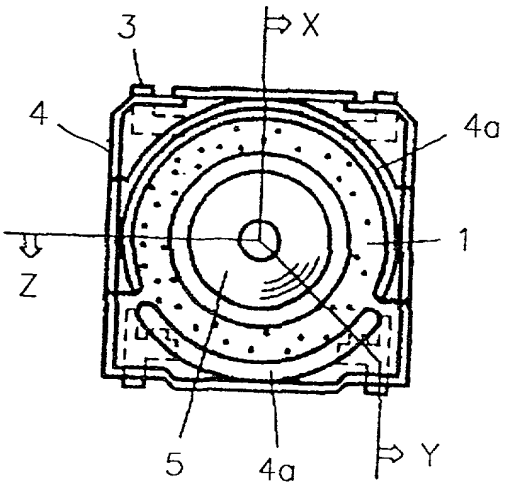

FIG. 5

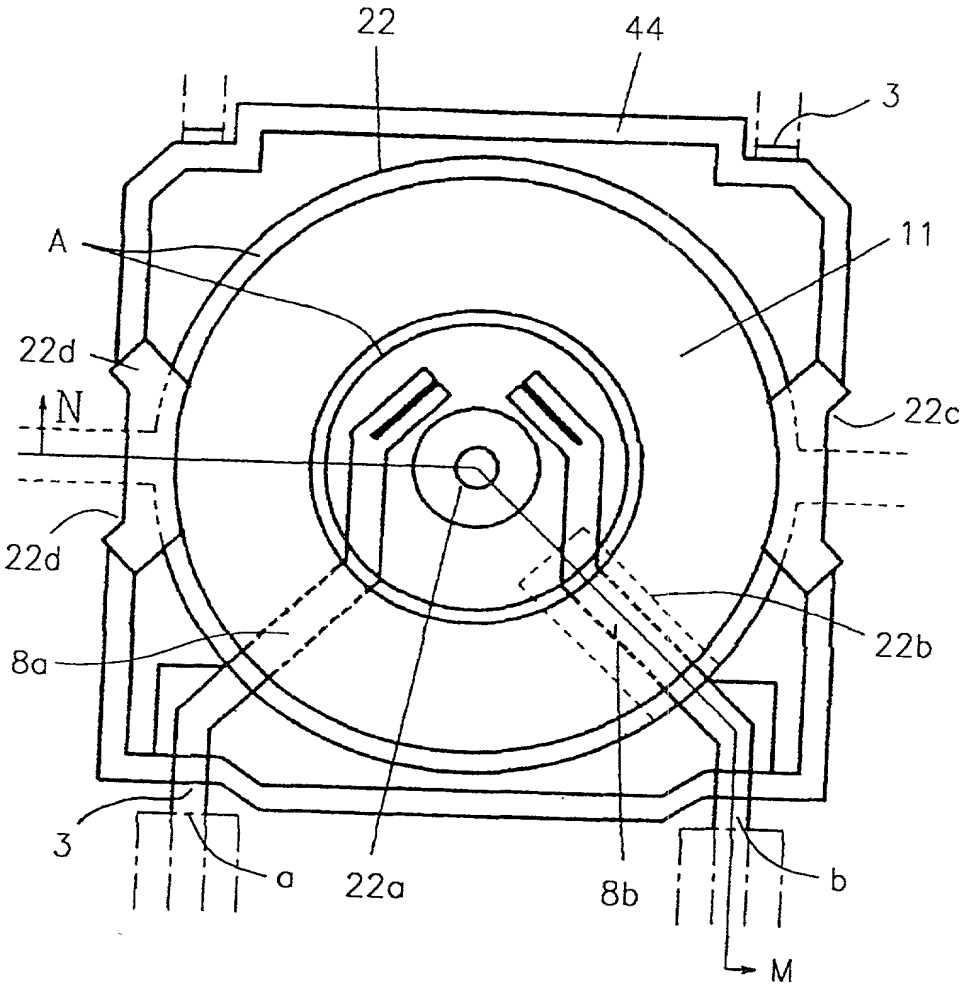
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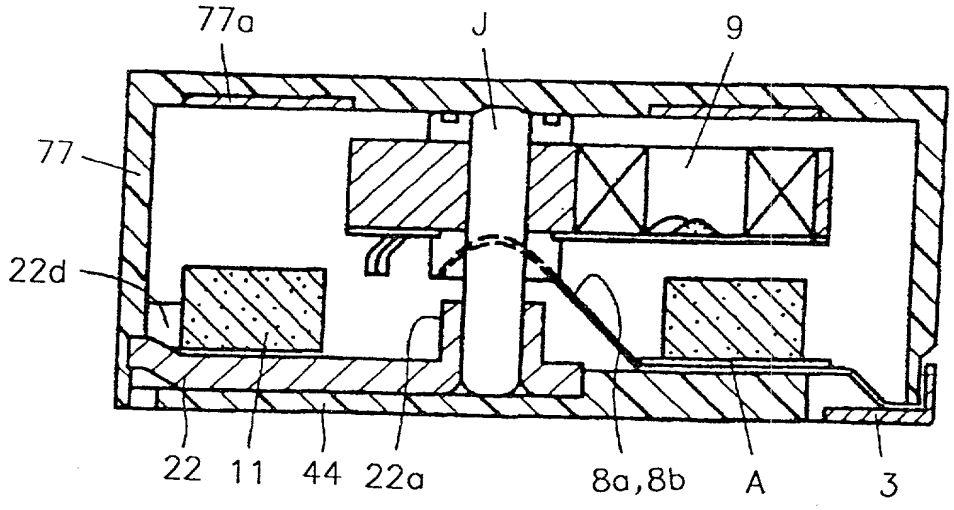
FIG. 6


77a
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Patent

Attorney Docket No. _____

DECLARATION AND POWER OF ATTORNEY

This declaration is of the following type:

[V] original [ ] design [ ] supplemental
[ ] national stage of PCT
[ ] divisional [ ] continuation [ ] continuation-in-part

As a below name inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe that I am the original, first and sole inventor (*if only one name is listed below*) or an original, first, and joint inventor(*if plural names are listed below*) of the subject matter which is claimed and for which a patent is sought on the invention entitled
MAGNETIC ASSEMBLY STRUCTURE USED FOR COMPACT ELECTRIC APPARATUS, METHOD OF FABRICATING THE MAGNETIC ASSEMELY STRUCTURE, AND COMPACT ELECTRIC APPARATUS ADOPTING THE MAGNETIC ASSEMBLY STRUCTURE
the specification of which:

(Check one)

[V] is attached hereto.

[ ] was filed on _____ as Serial No. _____ and was amended on _____ (*if applicable*).

[ ] was described and claimed in PCT International Application No. PCT/_____ filed on _____ and as amended pursuant to PCT Article 19 on _____ (*if any*).

I state that I have reviewed and understand the contents of the specification identified above, including the claim(s), as amended by any amendment referred to above.

I acknowledge the duty to disclose information that is material to the examination of the application identified above in accordance with 37 CFR § 1.56.

I claim foreign priority benefits pursuant to 35 USC § 119(a) of any foreign application(s) for patent or inventor or of any PCT international patent application(s) designating at least one country other

than the United States of America listed below and have also identified below any foreign application(s) for patent, utility model, design registration, or inventors certificate or any PCT international patent application(s) designating at least one country other than the United States of America filed by me for the same invention and having a filing date before that of the application(s) from which the benefit of priority is claimed.

PRIOR FOREIGN PATENT, UTILITY MODEL, AND DESIGN REGISTRATION APPLICATION, BENEFIT CLAIMED UNDER 35 USC § 119(a)

			Priority Claimed Under 35 USC § 119(a)
Japan	11-322024	12/November/1999	Yes V No ___
(Country)	(Prior Foreign Application No.)	(Day/Month/Year Filed)	

I claim the benefit pursuant to 35 USC § 119(e) of the following United States Provisional patent application(s):

PRIOR U.S. PROVISIONAL PATENT APPLICATIONS, BENEFIT CLAIMED UNDER 35 USC § 119(e)

Application No.	Filing Date (day,month,year)
Application No.	Filing Date (day,month,year)

I claim the benefit pursuant to 35 USC § 120 of any United States patent application(s) or PCT international patent application(s) designating the United States of America listed below and, insofar as the subject matter of each of the claims of this patent application is not disclosed in the prior patent application(s) in the manner provided by the first paragraph of 35 USC § 112, I acknowledge the duty to disclose material information as defined in 37 CFR § 1.56 effective between the filing date of the prior patent application(s) and the national or PCT international filing date of this patent application.

PRIOR U.S. PATENT APPLICATIONS OR PCT INTERNATIONAL PATENT

APPLICATIONS DESIGNATING THE U.S., BENEFIT CLAIMED UNDER 35 USC § 120

U.S. PATENT APPLICATIONS		**STATUS**
Application Serial No.	U.S. Filing Date	(Pat./Pend./Aban.)
Application Serial No.	Filing Date	Status (Pat./Pend./Aban.)

PCT APPLICATIONS DESIGNATING THE U.S.			**STATUS**
Application No.	Filing Date	U.S. Serial Nos. Assigned (if any)	(Pat./Pend./Aban.)
Application No.	Filing Date	U.S. Serial Nos. Assigned (if any)	(Pat./Pend./Aban.)

As a named inventor, I appoint the following attorneys to prosecute this application and transact all business in the Patent and Trademark Office connected with this patent application.

John M. Belz, Reg. 30,359
Jeffrey A. Wyand, Reg. 29,458
Jeremy M. Jay, Reg. 33,587
Michael H. Tobias, Reg. 32,948
Gregory A. Hunt, Reg. 41,085
Patrick R. Jewik, Reg. 40,456
Joseph S. Ostroff, Reg. 39,321

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700 Thirteenth Street, N.W., Suite 300
Washington, D.C. 20005-3960
Telephone (202) 737-6770

I authorize my attorneys to accept and follow instructions from _____

_____ regarding any matter related to the preparation, examination, grant, and maintenance of the patent application identified above, any continuation, continuation-in-part, or divisional patent application based on the patent application idenfified above, and any patent issuing from

that patent application, until I or my assigns withdraw this authorization in writing.

I declare that all statements made herein of my own knowledge are true, that all statements made on information and belief are believed to be true, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful fasle statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor: Tadao YAMAGUCHI

Inventors signature Tadao Yamaguchi

Date: 7 November 2000

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